

device also includes a contact aperture formed in the first and second layers using conventional techniques such as photolithography or laser drilling. The contact aperture exposes a portion of the connection pad such that a connection pin inserted into the aperture can contact the connection pad.--

* * * * *

Pursuant to 37 C.F.R. § 1.121, "marked up" versions of the foregoing amendments, highlighting the amendments made, appear on the "separate sheets" comprising Appendix A to this Response.

REMARKS

1. *Status of the Application.* Claims 18-46 were pending in the application prior to examination. In an August 9, 2002 Response to a prior Office Action in which a restriction requirement was imposed, the Assignee elected to prosecute claims 18-19, 21-23, 26, 27, 29-32, 34-36, 39, 40, and 42-46. The Office Action reiterated and made the imposition of the restriction requirement final. Consequently, non-elected claims 20, 24-25, 28, 33, 37-38, and 41 are canceled herein, and claims 18-19, 21-23, 26, 27, 29-32, 34-36, 39, 40, and 42-46 are amended herein; no new matter is added by way of these amendments.

In the Office Action, the title and the Abstract were objected to. Further, all elected dependent claims were objected to, and independent claims 18 and 31 were objected to. Further, claims 19, 26, 29, 31-32, 34-36, 39-40, and 42-46 were rejected under 35 U.S.C. § 112, Claims 18-19, 21-23, 26-27, and 30 were variously rejected under 35 U.S.C. § 103. The Office Action notes that no art rejections were applied to claims 29, 31-32, 34-36, 39-40 and 42-46 owing to alleged "confusion and uncertainty as to the proper interpretation of the limitations of [those] claims."

2. *The Objections.* The Office Action alleges a lack of descriptiveness of the title. The title has been amended herein, and is believed to be sufficiently descriptive of the invention. Reconsideration and withdrawal of the objection to the title is requested.

The Office Action further alleges that the Abstract failed to describe a method of forming a socket sufficiently. The Abstract has been amended herein and is believed to be fully descriptive of the inventive method. Reconsideration and withdrawal of the objection to the Abstract is requested.

The Office Action objected to the elected dependent claims which recited "A method in accordance with..." rather than "The method in accordance with...." Each elected dependent claim has been amended herein to incorporate the latter language. Reconsideration and withdrawal of the objection to the elected dependent claims is requested.

Claims 18 and 31 were objected to due to obviously typographical informalities. Claims 18 and 31 have been amended to eliminate these informalities. Reconsideration and withdrawal of the objection to claims 18 and 31 is therefore requested.

3. *The Section 112 Rejections.* Claims 19, 26, 29, 31-32, 34-36, 39-40, and 42-46 were rejected under 35 U.S.C. § 112 for allegedly lacking support in the specification.

First, the Office Action states that the specification does "not reasonably provide enablement for heating and cooling steps is [sic; being?] performed prior to forming an aperture step." The Office Action similarly states that the specification does not reasonably provide enablement for "inserting a pin step is [sic; being?] performed before the heating step, inserting a pin step is performed after the cooling step, cooling step is performed before the heating step, etc." The Office Action cites numerous other instances of alleged lack of support for hypothetical ordering of the recited method steps.

In each enumerated instance, the basis for the Office Action's rejection seems to be based on perceived ambiguity as to the order in which the various recited steps are performed to achieve the benefits of the claimed invention. In this regard, the Assignee respectfully submits that there is no ambiguity in the claims as examined, and that the necessary ordering of the

recited steps is clearly and unambiguously taught by the specification and unambiguously inferable from the claims themselves. It is not refuted that the specification does not support the various hypothetical orderings of method steps cited by the Office Action, because those hypothetical orderings are not how the invention is practiced. That is, the specification does not support the hypothetical orderings proposed by the Office Action precisely because the specification plainly teaches that such orderings are not how the invention is practiced. Reading the claims in light of the specification, as is demanded from the caselaw, there is no ambiguity in the claims.

Nevertheless, the claims have been amended herein to explicitly recite the ordering of the various steps. Reconsideration and withdrawal of the § 112 rejections of the claims is therefore respectfully requested.

With respect to claim 29, the Office Action inquires “what is a spin-on process[?]” and suggests that claim 29 “lacks the required steps of spin-on process.” It is respectfully submitted that “spin-on process” (sometimes referred to as “spin-on glas” or “SOG”) is a term of art well-known to those of ordinary skill in the area of semiconductor processing technology, and refers to a process whereby thin films of (typically organic) substances are formed on a surface. In support of its assertion that those of ordinary skill in the art would immediately recognize the term “spin-on process,” Assignee cites to the following issued U.S. patents which refer to “spin-on process” in their claims:

6,458,713	Method for manufacturing semiconductor device
6,458,697	Semiconductor device and manufacturing method therefor
6,458,431	Methods for the lithographic deposition of materials containing nanoparticles
6,456,525	Short-tolerant resistive cross point array
6,455,885	Inductor structure for high performance system-on-chip using post passivation process
6,455,416	Developer soluble dyed BARC for dual damascene process
6,455,329	Method for fabricating a capacitor in a semiconductor device
6,455,174	Magnetic recording medium, recording and reproducing head, and magnetic recording and reproducing method
6,452,757	Data sensor including layered dielectric gap

6,448,190 Method and apparatus for fabrication of integrated circuit by selective deposition of precursor liquid

Above-listed U.S. Patent No. 6,455,329, for example, includes the following claim:

14. The method according to claim 1, wherein the insulating material is coated by one of *spin-on* and Metal Organic Deposition (MOD) processes.

It is to be noted that the foregoing list of patents is merely representative. Performing a simple search on the U.S. Patent & Trademark Office's website, Assignee was able to identify literally thousands of issued U.S. Patents which use the term "spin-on process" (or obvious and common variations thereof) in contexts which make it abundantly clear that this is a widely known term whose meaning would be immediately apparent to those of ordinary skill in the art. Consequently, it is submitted that there is no basis for the Office Action to require claim 29 to recite the steps involved in a spin-on process.

The Office Action further inquires "what is [sic] photo define/etching process got to do with the claims?" noting that "[i]t sounds like the photo define/etching process removes rather than bonding [sic] the first material." It is respectfully submitted that those of ordinary skill in the art would fully and readily appreciate the recitation of claim 29 in its entirety, and specifically its recitation of a "photo define/etching process" as a complement to the recited spin-on process. Specifically, those of ordinary skill in the art would appreciate that the formation of the layers of first and second materials recited in the claims would be accomplished using conventional semiconductor processing techniques. As such, they would involve first forming a film over an unmasked portion of a substrate, and subsequently photo defining and etching away unwanted portions of the film, leaving the remaining area as the recited layer. It is submitted that these are basic semiconductor photolithography concepts that are so widely known and understood as a fundamental part of standard semiconductor fabrication that no further description of them need be provided either in the specification or the claims.

To the extent that the inquiries as to claim 29 in Section 9 of the Office Action constitute a § 112 rejection of claim 29, it is respectfully submitted that claim 29 would be perfectly

understood by persons of ordinary skill in the art. Reconsideration and withdrawal of any rejection of claim 29 on that basis is therefore requested.

4. *The Section 103 Rejections.* Claims 18-19, 21-23, 26-27, and 30 were variously rejected under 35 U.S.C. § 103 as being unpatentable over certain hypothetical combinations of prior art references, including U.S. Patent No. 4,513,055 to Leibowitz ("Leibowitz"), U.S. Patent No. 6,274,932 to Mikagi ("Mikagi"), and U.S. Patent No. 6,187,700 to Merkel ("Merkel"). As discussed below, it is respectfully submitted that these rejections are improper and not supported by the prior art cited.

Claims 18-19, 21, and 26 were rejected under 35 U.S.C. § 103 as being unpatentable over *Leibowitz* in view of *Mikagi*. According to the Office Action, *Leibowitz* "discloses forming a circuit board having layers 18 and 20, applying an interfacial material (22) and a polyimide." The Office Action acknowledges that *Leibowitz* fails to disclose forming an aperture to expose the contact pad, but notes that *Mikagi* does so.

A rejection based on §103(a) must establish three basic criteria in order to establish a *prima facie* case of obviousness. "First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or combined referenced teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." MPEP §§706.02(j); *see also* 2142. Specifically, since "invention itself is the process of combining prior art in a non-obvious manner," to establish obviousness the "Examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed." *In re Rouffet*, 47 USPQ2d 1453, 1458 (Fed. Cir. 1998). Importantly, examiners are forbidden from "the use of hind-sight in the selection of references that comprise the case of obviousness." *Id.*

As with all rejections, the burden is on the Examiner to establish an "unrebutted *prima facie* case of obviousness." *Id.* at 1455. "An applicant may specifically challenge an obviousness

rejection by showing that the [Examiner] reached an incorrect conclusion of obviousness or that the [Examiner] based its obviousness determination on incorrect factual predicates." *Id.* As discussed below, it is respectfully submitted that the Office Action does not present a *prima facie* case of obviousness as to the present rejections, in that it fails to make a *prima facie* showing that persons skilled in the art would have made the proposed hypothetical combination, and further that it fails to make a *prima facie* showing that the proposed combination, if made, would achieve the objectives of the present invention.

The ultimate determination of whether an invention is or is not obvious is a legal conclusion based on underlying factual inquiries including: (1) the scope and content of the prior art; (2) the level of ordinary skill in the prior art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18; 148 USPQ 459, 467 (1966).

"[W]hen the issue is obviousness, 'it is fundamental that rejections under 35 U.S.C. §103 must be based on evidence comprehended by the language of that section.' *In re Grasselli*, 713 F.2d 731, 739, 218 USPQ2d 769, 775 (Fed. Cir. 1983). The essential factual evidence on the issue of obviousness is set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966) and extensive ensuing precedent. The patent examination process centers on prior art and analysis thereof. When patentability turns on the question of obviousness, the search for and analysis of the prior art includes evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references relied on as evidence of obviousness. See, e.g., *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52, 60 USPQ2d 1001, 1008 (Fed. Cir. 2001) ("the central question is whether there is reason to combine [the] references," a question of fact drawing on the *Graham* factors).

'The factual inquiry whether to combine references must be thorough and searching.' *Id.* It must be based on objective evidence of record. This precedent has been reinforced in myriad decisions, and cannot be dispensed with. See, e.g., *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1124-25, 56 USPQ2d 1456, 1459 (Fed. Cir. 2000) ("a showing of a suggestion, teaching, or motivation to combine the prior art references is an 'essential component of an obviousness holding' ") (quoting *C.R. Bard, Inc. v. M3 Systems, Inc.*, 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232 (Fed. Cir. 1998)); *In re Dembiczaik*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999) ("Our case law makes clear that the best defense against the subtle but powerful

attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references."); *In re Dance*, 160 F.3d 1339, 1343, 48 USPQ2d 1635, 1637 (Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant); *In re Fine*; 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988) ("teachings of references can be combined *only* if there is some suggestion or incentive to do so.' ") (emphasis in original) (quoting *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984)).

The need for specificity pervades this authority. See, e.g., *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000) ("particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed"); *In re Rouffet*, 149 F.3d 1350, 1359, 47 USPQ2d 1453, 1459 (Fed. Cir. 1998) ("even when the level of skill in the art is high, the Board must identify specifically the principle, known to one of ordinary skill, that suggest the claimed combination. In other words, the Board must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious."); *In re Fitch*, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992) (the examiner can satisfy the burden of showing obviousness of the combination "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references."). *In re Lee*, 61 USPQ2d 1430, 1433-34, (CAFC 2002).

In the present application, the subject matter of claimed invention taken as a whole would have been unobvious to a person skilled in the art at the time of the invention. There is no suggestion or incentive to combine the cited art to achieve Applicant's claimed invention. The Office Action has not provided any particular finding as to the reason a skilled artisan, with no knowledge of the claimed invention, would have selected components for combination in the manner claimed. *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000), cited in *In re Lee*, 61 USPQ2d 1430 (CAFC 2002).

First and foremost, it is noted that *Leibowitz* is directed to a *printed circuit board*, and makes no mention whatsoever of the subject matter of the present application, namely electrical contact sockets. *Leibowitz* appears to be concerned with providing a composite printed circuit board having a coefficient of thermal expansion that be "regulated or adjusted to closely match

the thermal coefficient of chip carriers by varying ... the ratio of volumes (and hence weights) of the positive and negative thermal coefficient yarns of the thermal coefficient control fabric.” *Leibowitz*, col. 3, lines 38-43.

Likewise, *Mikagi* is directed to subject matter wholly unrelated to the subject matter of the present application. *Mikagi* appears to be directed to a multilevel interconnection structure in a semiconductor device, and like *Leibowitz* makes no reference whatsoever to contact pin sockets for packaged semiconductor devices.

The “aperture” alleged by the Office Action to be shown in *Mikagi* is not a socket, but an “interlayer contact hole” reaching the diffusion layer of a semiconductor substrate. *See, Mikagi*, col. 6, line 41-44. From Figures 2D and 2E in *Mikagi* and associated portions of the *Mikagi* specification, it is clear that this interlayer contact hole is ultimately filled with an aluminum film 114 (*see, Mikagi*, col. 2, lines 7-9). Thus, *Mikagi*, like *Leibowitz*, wholly fails to teach or suggest formation of a “contact.”

From the foregoing discussion, it is apparent that (1) the Office Action provides no basis for concluding that a person of ordinary skill in the art would be motivated in any way to make the proposed hypothetical combination of *Leibowitz* and *Mikagi*; and (2) that even if the proposed hypothetical combination was made, this would not even remotely achieve the objectives of the present invention, given that neither *Leibowitz* nor *Mikagi* relates in any way to the subject of contact pin sockets and their formation. Reconsideration and withdrawal of the § 103 rejections of claims 18-19, 21, and 26 is therefore requested.

Claims 22, 23, and 27 were rejected under § 103 as being unpatentable over the proposed hypothetical combination of *Leibowitz* and *Mikagi* as applied to the claims discussed above, further in view of *Merkel*. It is submitted that the foregoing discussion of the *Leibowitz/Mikagi* combination is equally applicable to the rejection of claims 22, 23, and 27, and that discussion is reiterated here.

With respect to *Merkel*, the Office Action states only that it “discloses providing zirconium tungstate,” and makes the wildly conclusory and unsupported allegation that it would have been obvious to one of ordinary skill in the art “to modify the *Leibowitz/Mikagi* by

providing zirconium tungstate, as taught by *Merkel*, for the purpose of providing greater range of negative coefficient of thermal expansion without yarns."

It is noted that like *Leibowitz* and *Mikagi*, *Merkel* is directed to subject matter wholly unrelated to zero insertion force contact pin sockets or their formation. This fact alone belies any suggestion that a person of ordinary skill in the *relevant* art would be motivated to make the proposed *Leibowitz/Mikagi/Merkel* combination. Furthermore, even if such combination were made, the result would be of no relevance to the present invention, as *none* of these references relates in any way to formation of zero insertion force sockets. Reconsideration and withdrawal of the § 103 rejection of claims 22, 23, and 27 is therefore requested.

Claim 30 was rejected under § 103 as being unpatentable over the proposed hypothetical combination of *Leibowitz* and *Mikagi*, further in view of "Official Notice." According to the Office Action, "it is well known in the art to form the second aperture smaller than the first aperture for the purpose of preventing a conductive material to [sic] escaping from the aperture during assembly."

It is submitted that the foregoing remarks with respect to the § 103 rejection of claims 18-19, 21, and 26 are equally applicable to the rejection of claim 30, and those remarks are reiterated here. With regard to the issue of which Official Notice is made, this is believed to be of no relevance, inasmuch as the proposed *Leibowitz/Mikagi* combination, even if made, would neither teach nor suggest a structure or method even remotely resembling the claimed invention. Reconsideration and withdrawal of the rejection of claim 30 is therefore requested.

5. *The Remaining Claims.* The Office Action notes that no art rejection is applied to claims 29, 31-32, 34-36, 39-40 and 42-46 owing to "a great deal of confusion and uncertainty as to the proper interpretation" of the claims.

It is respectfully submitted that any ambiguity in the claims has been eliminated by way of the foregoing amendments to the claims, as discussed in Section 3 above, and that consequently there is no basis for rejecting the claims on this basis.

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Though no art rejections were applied to these claims, Assignee takes this opportunity to reiterate the arguments made in Section 4 above with respect to the § 103 rejections, and respectfully submits that there is similarly no basis for rejecting these claims based on the cited prior art. There is utterly no basis for suggesting that a person of ordinary skill in the art would be motivated to make the hypothetical prior art combinations proposed in the Office Action. Moreover, even if the combinations were made, they could not possibly render the claims obvious, given the un-relatedness of the subject matter of each of the cited references to the invention disclosed and claimed in the present application.

* * * * *

CONCLUSION

In view of the foregoing, it is believed that each of the claims pending in the application allowable, and that the application as a whole is in proper form and condition for allowance. Examination and allowance is therefore respectfully requested, such that the application may advance to issuance at the earliest possible date. If the Examiner believes that the application can be placed in even better condition for allowance, he is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 4-OCT-2002

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APPENDIX A
“MARKED UP” VERSIONS OF AMENDED TEXT
PURSUANT TO 37 C.F.R. § 1.121

Title of the Invention

The Title was amended as follows:

--METHOD FOR FORMING NOVEL ZERO INSERTION FORCE SOCKETS USING NEGATIVE THERMAL EXPANSION MATERIALS--

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OCT 10 2002

In the Claims

The claims were amended as follows:

TECHNOLOGY CENTER R3700

18. (once amended) A method of forming a socket for receiving a terminal pin from an electronic component therein, comprising in order:

- (1) forming a layer of a first material on an upper surface of a substrate;
- (2) forming a layer of a second material on said [said] layer of said first material; and
- (3) forming an aperture in said first and second layers to expose said upper surface of said substrate;

wherein said first material has a positive coefficient of thermal expansion and said second material has a negative coefficient of thermal expansion.

19. (once amended) [A] The method in accordance with claim 18, further comprising, prior to step (1) of forming a layer of a first material:

forming an electrical contact pad on said substrate such that said contact pad is at least partially exposed within said aperture.

20. <*canceled*>

21. (once amended) [A] The method in accordance with claim 18, wherein said first material is a polyimide.

22. (once amended) [A] The method in accordance with claim 18, wherein said second material is zirconium tungstate.

23. (once amended) [A] The method in accordance with claim 22, wherein said zirconium tungstate is single-crystal zirconium tungstate.

24. *< canceled >*

25. *< canceled >*

26. (once amended) [A] The method in accordance with claim 18, further comprising, between step (1) of forming a layer of a first material and step (2) of forming a layer of a second material:
applying an interfacial material between said layer of first material and said layer of second material to permit relative movement between said layer of first material and said layer of second material.

27. (once amended) [A] The method in accordance with claim 18, wherein said substrate is ceramic.

28. *< canceled >*

29. (once amended) [A] The method in accordance with claim 18, wherein said layer of first material is bonded to said substrate using a spin-on and photo define/etch process.

30. (once amended) [A] The method in accordance with claim 18, wherein said step (3) of forming said aperture comprises forming a first aperture in said layer of first material and a second aperture in said layer of second material, wherein said second aperture has a linear dimension smaller than said first aperture.

31. (once amended) A method of electrically connecting an electronic component having a contact pin extending therefrom to a contact pad on a substrate, comprising, in order:

(1) forming a layer of a first material on an upper surface of said substrate;

(2) forming a layer of a second material on said [said] layer of said first material; and
(3) forming an aperture in said first and second layers to expose said upper surface of said substrate;

wherein said first material has a positive coefficient of thermal expansion and said second material has a negative coefficient of thermal expansion;

and wherein said method further comprises, in order, subsequent to step (3) of forming an aperture in said first and second layers:

(4) heating said layer of first material and said layer of second material to a temperature substantially above a range of normal operating temperatures for said electronic component;

(5) inserting said contact pin into said aperture; and

(6) cooling said layer of first material and said layer of second material to a temperature within said range of normal operating temperatures for said electronic component.

32. (once amended) [A] The method in accordance with claim 31, further comprising, prior to step (1) of forming a layer of a first material:

forming an electrical contact pad on said substrate such that said contact pad is at least partially exposed within said aperture.

33. <*canceled*>

34. (once amended) [A] The method in accordance with claim 31, wherein said first material is a polyimide.

35. (once amended) [A] The method in accordance with claim 31, wherein said second material is zirconium tungstate.

36. (once amended) [A] The method in accordance with claim 35, wherein said zirconium tungstate is single-crystal zirconium tungstate.

37. <*canceled*>

38. <*canceled*>

39. (once amended) [A] The method in accordance with claim 31, further comprising, between step (1) of forming a layer of a first material and step (2) of forming a layer of a second material:
applying an interfacial material between said layer of first material and said layer of second material to permit relative movement between said layer of first material and said layer of second material.

40. (once amended) [A] The method in accordance with claim 31, wherein said substrate is ceramic.

41. <*canceled*>

42. (once amended) [A] The method in accordance with claim 31, wherein said layer of first material is bonded to said substrate using a spin-on and photo define/etch process.

43. (once amended) [A] The method in accordance with claim 31, wherein said step (3) of forming said aperture comprises forming a first aperture in said layer of first material and a second aperture in said layer of second material, wherein said second aperture has a linear dimension smaller than said first aperture.

44. (once amended) [A] The method in accordance with claim 31, wherein said step (4) of heating said layer of first material and said layer of second material comprises heating said layer of first material and said layer of second material to a temperature of between approximately 200°C and 250°C.

45. (once amended) [A] The method in accordance with claim 44, wherein a normal operating temperature for said electronic component is approximately 100°C.

46. (once amended) [A] The method in accordance with claim 31, wherein said step (6) of cooling said layer of first material and said layer of second material comprises cooling said layer of first material at a rate slower than the rate at which said layer of second material is cooled.

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In the Abstract

A new Abstract was provided, as shown on the following page, "apart from any other text," as required by the Office Action: